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Study of Physical Fitness Index using Modified Harvard step test.

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Abstract

The Physical Fitness index measures the physical fitness for Muscular work & the ability to recover from the work. The present study was undertaken to assess the physical fitness index using Modified Harvard Step Test in young adult in the age group of 17 to 23 years with varying degree of physical activities. The study was undertaken to assess Physical Fitness Index (PFI) using modified Harvard step test . Out of 70 students 40 are males and 30 females. 14 students had Excellent Physical Fitness Index Scoring, 23 students had Good PFI scoring, 24 students had Fair PFI scoring ,9 students had Poor PFI scoring. This study has clearly established that physical activity is an important determinant and predictor of physical fitness.

Key words : Modified Harvard step test. Physical Fitness index.

Introduction

Physical fitness implies performing an inactive task efficiently along with sense of physical, mental and social well-being and the ability to deal with crisis demanding unusual physical endeavor. Low levels of physical fitness leads to obesity in individuals. In the past three decades the adult obesity rates have almost quadrupled [1-6]. Medical students during their curriculum are dealt with different kinds of burdens and stress and due to a more sedentary lifestyle, there's a decrease in physical fitness levels [7-12]. Physical fitness implies not only the absence of disabling deformity or disease and the capacity to perform a sedentary task efficiently but also a sense of physical well-being and the capacity to deal with emergencies demanding unaccustomed physical effort. Physical activity relates to any movement produced by the individual's skeletal muscles that results in energy expenditure[13]. Physical fitness is a set of attributes a person have or achieve,which is linked to the person's capability to do physical activity [14]. Fitness is divided into health and skill related components, with the health component further consists of cardiorespiratory endurance, muscular endurance,

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muscular strength, and flexibility[15] An individual is considered to be fit for a particular task or activity when he can accomplish it with a reasonable degree of efficiency without undue fatigue and with rapid recovery from the effect of exertion. Physiological fitness implies the capacity for skillful performance and rapid recovery. Physiological effort is estimated from the magnitude of the heart rate change during exercise and front the rapidity of return of the heart rate to normal following the exercise.Fitness can improve brain health, help manage weight, reduce the risk of disease, strengthen bone and muscle, and improve ability to do everyday activity. Fitness assessment is done by maximal and submaximal tests. Submaximal test includes Bruce treadmill test, 6-minute walk test. Maximal test includes Harvard step test. Modified Harvard step test is a good measurement of fitness and a person's ability to recover after a strenuous exercise by checking the recovery rate. The test was developed by Lucien Brouha and his associates in 1942. Heart rate recovery is one of the indicators of fitness levels. It is the ability of heart to come back to the resting level as soon as possible. Decreased fitness level is liable for approximately 30% of all deaths mainly due to heart disease, diabetes & carcinoma. Beginning active lifestyle early could significantly reduce mortality from these events. In this study, Physical Fitness Index of Medical students was assessed using a Modified Harvard step test. The Harvard step test (HST) was devised by Johnson et al. to assess the physical fitness of individuals.[16] It comprises stepping up and down a step that is 20 inches (50.8 cm) high at a rate of 30 times/min.[17] The total duration of stepping exercise and the post-exercise pulse rate are noted and used for calculating the physical fitness index (PFI). The higher the fitness of an individual, less is the increase in heart rate and faster is the recovery. However, as the name suggests, the 20” step of the HST is tailored to western anthropometrics and is rather high for Indian whose height is relatively less. Hence, the Harvard step would pose a greater exercise challenge to the Indian with average height. Therefore, the height of the step is lower in the modified HST that is used in India.[18] Even so, it is unlikely that a single step-height will be appropriate for all Indians with different heights.

Material and Methods

A cross-sectional study was conducted by simple random sampling method in college going Medical students. Modified Harvard step test was performed to evaluate the fitness level among students.

Inclusive Criteria:

1. Healthy young male & female students

2. Age between 17 to 23 years

Exclusive Criteria:

1. Student with Locomotor& Musculoskeletal disability

2. History of Cardiovascular disorder

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3. History of Respiratory disorders

4. History of Diabetes mellitus, Hypertension

5. History of Major surgery in the recent past

6. History of Drug intake

7. History of Alcohol & Smoking

Modified Harvard step bench = 33cm, Stop watch, Metronome, Weight & Height measurement machine .

1: Modified Harvard Step bench: It is used for Harvard Step exercise testing

2: Stopwatch: It is used to record the timing in seconds during the procedure

3: Metronome App: It is used to adjust the frequency of steps.

4: Weighing Machine: It is used to measure the weight.

5: Stadiometer: It is used to measure the height.

Modified Harvard Step Test

The subjects were asked to relax during the procedure. Recording of Physical Fitness Index was done by using Modified Harvard Step Test. The subjects were asked to be lightly clothed. They were asked to sit quietly for 5 min. Then resting pulse rate was recorded by palpating the radial artery manually. Thereafter, they were asked to perform the stepping exercise. The person who is taking the test steps up and down on a platform in a cycle of 2 seconds. The step is at a height of 33cms a wooden box. The rate of 30 steps per minute must be sustained for five minutes or until the point of exhaustion, which means the point at which the subject cannot maintain the stepping rate for 15 seconds. Stepping up and down a 33 cms high step box at a rate of 30 times/min for 5 min. Those with heart rates above 200 beats per minute, had heavy breathing, or unable to sustain, were stopped immediately. Once the participants have accomplished the step test or were ceased due to the mentioned reasons, were quickly made to sit down on the box and rest. The fitness test was conducted under close supervision. The detailed procedure of the exercise test was explained to the subjects & an actual demonstration was given before starting the test.

Procedure: The Subject was advised to step up on the modified Harvard steps of 33cms height once every two seconds (30 per minute) for 5 minutes, a total of 150 steps. At one, three and five minutes during the test, pulse rate was recorded as

(a) PR1 (Pulse Rate 1) – 1 min after exercise

(b)PR2 (Pulse Rate 2) – 3 min after exercise.

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(c)PR3 (Pulse Rate 3) – 5 min after exercise.

The Physical Fitness Index is calculated by using the following formulae.

PFI =Duration of exercise in seconds x 100/2(pulse 1+2+3)

The collected data was managed and subjected to basis descriptive statistics in MS-Excel. A total number of 70 young students were assessed to evaluate the fitness level. Response were determined and presented in tabular and graphic formats.

Results

Table 1: Physical Fitness Index Rating (Edward L. Fox. et al., 1973)

PFI Rating	Males	Females
Excellent	>115	>91
Good	103-115	84-91
Fair	91-102	77-83
Poor	<91	<77

Table 2 : Gender of Subjects

Gender	Total subjects n =70	Percentage
Males	40	57.14 %
Females	30	43.85 %

Table 3 : Profile of Subjects

Gender	Total subjects n =70	Age (Mean ±SD) Years	BMI(Mean ±SD) Kg/ m^2
Males	40	19.3±2.12	22.2±3.42
Females	30	19.1±1.98	21.6±3.14

Table 4: Physical Fitness Index Scoring

PFI Scoring	Males	Females	Total
Excellent	05	09	14
Good	12	11	23
Fair	18	06	24
Poor	05	04	09
Total	40	30	70

Figure 1: Physical Fitness Index Scoring

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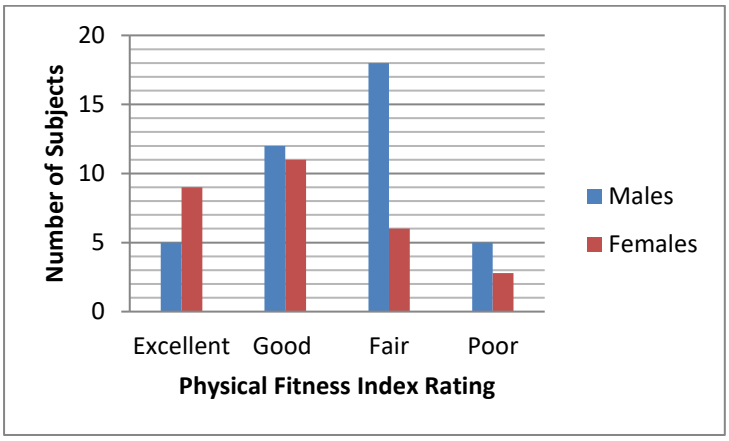

The present study evaluated the physical fitness of young students using modified Harvard step method. Out of 70 students 40 are males and 30 females. 14 students had Excellent Physical Fitness Index Scoring, 23 students had Good PFI scoring, 24 students had Fair PFI scoring ,9 students had Poor PFI scoring. 9 females had excellent score and 5 males had excellent score, 18 males had Fair and 6 females had Fair PFI scoring.

Discussion

Several studies have established that physical fitness is necessary to carry out daily task. The effect of regular exercise is known to have beneficial effect on health. Importance of physical fitness has been mentioned in the history of mankind including Vedas. Yet, physiology of exercise is a recent advancement and is an open field for research[19].The present study evaluated the physical fitness of young students using modified Harvard step method. Several studies have established that physical fitness is necessary to carry out daily task. The present study evaluated the physical fitness of young students using modified Harvard step method. Out of 70 students 40 are males and 30 females. 14 students had Excellent Physical Fitness Index Scoring, 23 students had Good PFI scoring, 24 students had Fair PFI scoring ,9 students had Poor PFI scoring. 9 females had excellent score and 5 males had excellent score, 18 males had Fair and 6 females had Fair PFI scoring. The effect of regular exercise is known to have beneficial effect on health. Harvard step test has four grades of physical fitness based on the scoring obtained after performing step test. The height of stepper used in Modified Harvard Step Test is found to be suitable height for Indian male and female. Physical education, sports and health are part of education as a whole. Sports and health physical education has a unique position in education because it develops the psychomotor domain as its main goal, but does not neglect the development of the cognitive and affective domains. In its implementation, physical education has several regulations, several inrelated to safety and some management [20]. Physical education is formally instilling p Science and value through activities that include learning in development and body care, from simple exercises to yoga practice, gymnastics and performances and athletic play [21]. Education in PE is to promote skills competency motor and knowledge growth that can be sustained, if integrated knowledge with physical activity and contribution age the mission of education in school so provide a balanced and consistent approach to educating children [22]. It can be said, that

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physical education provides opportunities for students to be physically active while at school or campus, and develop the level of physical fitness of students and apply knowledge of physical fitness as a guide for carrying out an active lifestyle during spare time at home or, rather, taking time to develop physical activity.[23]All of these goals lead to the goal of delivering successful students in learning to achieve their goals.

Conclusion

There is a need to know the physical fitness level of our future Students . They can be sensitized to pursue a healthy life style right from the beginning of their career. The physical fitness index (PFI) measures the physical fitness for muscular work and the ability to recover from the work. The study was undertaken to assess (PFI) using modified Harvard step test. This study has clearly established that physical activity is an important determinant and predictor of physical fitness. Pulse rate variability was minimum among subjects who had excellent physical fitness and it was maximum among subjects who had poor physical fitness index.

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